UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/846,596	04/30/2001	Cornelis Bernardus Aloysius Wouters	PHNL 000240	4795

			EXAMINER
24737	7590	05/13/2005	CHOI, WOO H

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
P.O. BOX 3001
BRIARCLIFF MANOR, NY 10510

ART UNIT	PAPER NUMBER
2189	

DATE MAILED: 05/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _16 March 2005_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-3,5-9 and 11-17_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-3,5-9 and 11-17_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
since a specific reference was included in the first sentence of the specification or in an Application Data Sheet.
37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific
reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4)☐ Interview Summary (PTO-413) Paper No(s). _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: .

DETAILED ACTION

Specification

1.   The title of the invention is not descriptive. A new title is required that is clearly

indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

2.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the
> subject matter which the applicant regards as his invention.

3.   Claims 1 – 3, 5 – 9 and 11 – 17 are rejected under 35 U.S.C. 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

4.   Claims 1, 7 and 15 recite the limitation "the blocks from said variety" in line 10. Prior to

this limitation, the claims recite "a variety of blocks", "the first block", and "the second block."

It is not clear as to whether "the blocks" refers to the entire "variety of blocks", a subset of the

"variety of blocks" or "the first and the second blocks" which are also from said variety.

The claims recite the limitation "the block concerned" in line 11. It is not clear which

particular block this limitation refers to.

The claims recite the limitation "the counters" in line 12. The closest antecedence basis

for this limitation is the limitation "the blocks from said variety have an associated counter."

However, this limitation associates "a counter" with "the blocks." There is insufficient

antecedent basis for the plural counters in the claim.

The claims recite the limitation "the counter of the first block" in line 14. While there is an associated counter for the blocks, there is insufficient antecedent basis for "the counter of the first block."

The claims recite the limitations "the limit value" and "said limit value" in lines 13 – 14. The claims require that "a limit value" be increased. While it is clear that "the limit value" refers to the limit value before it is increased, it is not clear whether "said limit value" refers to the limit value before or after it is increased. Claim 17 suffers from a similar problem.

5.   Claims 2 and 7 recite the limitation "the counter" in lines 3 and 4. The parent claims recite the limitations "a counter" that is associated with "the blocks", "the counters of the blocks", and "the counter of the fist block." It is not clear which particular counter "the counter" refers to.

6.   Claim 8 recites the limitation "the value of the counter" in line 3. It is not clear which particular counter this limitation is referring to.

7.   Claim 15 recites the limitation " a first iteration" and "a second iteration" in lines 3 and 4, respectively. The claim does not define what an iteration cycle consists of. The specification does not define what "an iteration" is. It is not clear what is being repeated or iterated in "a first iteration" and "a second iteration".

8.   Claim 17 recites the limitation "said processor copied data." There is insufficient

antecedent basis for this limitation in the claim.

9.   All of the dependent claims are rejected for depending from defective parent claims.

Claim Rejections - 35 USC § 103

10.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

11.   Claims 1 – 3, 5 – 9, 11 – 13 and 15 – 17 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Assar *et al.* (PCT Publication No. WO 95/10083, hereinafter "Assar").

12.   With respect to claims 1, 7, 13 and 15 – 17, Assar discloses a method of data

management on a storage medium (figure 6, Flash Memory Device), the storage medium

comprising a variety of blocks in which data can be stored, a first block from said variety being

selected to execute a mutation on, characterized by determining whether the wear level of the

first block is acceptable for executing the mutation, and if so, executing the mutation on the first

block, and otherwise choosing from said variety a second block with a lower wear level than the

first block, and copying the data of the second block to the first block (page 16, lines 19 – 29),

wherein the blocks from said variety have an associated counter for counting the number

of mutations in the block concerned (figure 10, 620).

However, Assar does not specifically disclose that the limit value is increased when a

predetermined number which is at least the majority of the counters of the blocks from said

variety exceed the limit value, said determining being based on said limit value and a value of

the counter of the first block. On the other hand Assar discloses a functionally equivalent

method where the limit value is effectively increased when a predetermined number which is at

least the majority of the counters of the blocks from said variety reach a maximum value (page

16, lines 19 – 31) by resetting the counters (see also figure 7, step 238). The limit values in

Applicant's and Assar's inventions are used for wear leveling which is a mechanism used to

ensure that all blocks are written to or erased fairly evenly. In both inventions, when an erasure

count reaches a certain threshold, the data content of the block is swapped with one that is less

frequently erased and the block that reached the threshold is not erased until the next wear

leveling cycle. When the majority of block erasure counters reach the threshold (i.e. wear level

is fairly even), the threshold is lifted, or increased, relative to the counters, so that the blocks can

be erased (or written to) again and the wear leveling cycle begins anew. In Applicant's

invention, the threshold value is increased by increasing the limit value while retaining the

counter values. Assar's invention increases this threshold by maintaining the limit value while

resetting (or decreasing) the counter values.

The difference between Assar and the claims is the method of increasing the threshold

value relative to the counter values to start a new wear leveling cycle. However, this particular

method of increasing the limit value while retaining the counter values, as opposed to retaining

the limit value while resetting the counter values, does not have a disclosed purpose nor is it

disclosed to overcome any deficiencies in the prior art. Accordingly, it would have been an

obvious matter of design choice to use the method of increase the threshold value for new wear

leveling cycle as opposed to resetting the counter values, since applicant has not disclosed that

Applicant's method of increasing the threshold value relative to the counter values (or any other

method of increasing the threshold value relative the counter values), overcomes a deficiency in

the prior art or is for any stated purpose.

Because a flash cell device has a maximum life in terms of erase-write cycles, there's a

need to keep track of the total number of erase cycles to be able to determine the remaining life

of a device. One would be motivated to use the method of increasing the limit value while

keeping the total counts intact to be able to keep accurate track of the total number of erase

cycles on a per block basis for optimal use of all of the blocks. On the other hand, the method of

keeping the limit value while resetting the counter has the advantage of having smaller counters

using less number of bits and requiring simpler comparison operations. However, since the total

erase count is reset, the system can easily keep track of the overall wear level by keeping track of

the number of wear-level cycle operations, but the total counts for individual blocks are lost.

There are different advantages and disadvantages for each of the methods. A flash memory

system designer would be motivated to choose one or the other depending on his/her preference

and design criteria.

13.   Claims 1 – 3, 5 – 9, 11 – 13, and 15 – 17 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Assar in view of Bruce *et al.* (US Patent No. 6,000,006, hereinafter "Bruce").

        With respect to claims 1, 7, 13, 15 – 17, Assar discloses a method of data management on

a storage medium (figure 6, Flash Memory Device), the storage medium comprising a variety of

blocks in which data can be stored, a first block from said variety of blocks being selected to

execute a mutation on, characterized by determining whether the wear level of the first block is

acceptable for executing the mutation, and if so, executing the mutation on the first block, and

otherwise choosing from said variety a second block with a lower wear level than the first block,

and copying the data of the second block to the first block (page 16, lines 19 – 29),

        wherein the blocks from said variety have an associated counter for counting the number

of mutations in the block concerned (figure 10, 620).

        However, while Assar discloses a functionally equivalent method of increasing the limit

value where the limit value is effectively increased when a predetermined number which is at

least the majority of the counters of the blocks from said variety reach a maximum value (page

16, lines 19 – 31) by resetting the counters (see also figure 7, step 238), Assar does not

specifically disclose that the limit value is increased when a predetermined number which is at

least the majority of the counters of the blocks from said variety exceed the limit value, said

determining being based on said limit value and a value of the counter of the first block.   On the

other hand, Bruce specifically discloses a method of data management on a storage medium comprising a variety of blocks in which data can be store, where the limit value is increased when a predetermined number which is at least the majority of the counters of the blocks from the variety of blocks exceed the limit value (abstract, last 4 sentences, col. 9, lines 13 – 20).

It would have been obvious to one of ordinary skill in the art, having the teachings of Assar and Bruce before him at the time the invention was made, to use the threshold adjustment teachings of the flash memory storage system of Bruce, in the flash memory storage system of Assar, in order to minimize excess writes to flash memory while re-mapping address to pages of flash memory and be able to use a unified table for re-mapping, wear-leveling, and caching flash memories (Bruce, col. 2, lines 55 – 59).

It also would have been obvious to one of ordinary skill in the art, having the teachings of Assar and Bruce before him at the time the invention was made, to use the threshold adjustment teachings of the flash memory storage system of Bruce, in the flash memory storage system of Assar, in order to be able to determine the total number of erase/write cycles to a given block of flash memory (Bruce, col. 2, lines 31 – 33). This allows for a more efficient and exact wear-leveling scheme (Bruce col. 2, lines 54 – 55). Assar specifically discloses that periodically clearing the erase counters is undesirable because there is no way to determine the total number of erase/write cycles to a give block of flash memory.

14.   With respect to claims 2 and 8, the method is characterized in that when the value of the counter of the first block is smaller than the limit value, the value of the counter is increased and the mutation is executed, and otherwise a block of which the counter has a lower value than the counter of the first block is chosen as the second block (Assar, page 16, lines 20 – 25).

15.   With respect to claims 3 and 9, the method is characterized in that the lower value is the lowest value of the values of the counters of the blocks from said variety (Assar, page 16, lines 22 – 25).

16.   With respect to claims 5 and 12, the method is characterized in that the second block is erased after the data of the second block have been copied to the first block (this is inherent in flash memory store as the flash memory cells need to erased before new information can be written).

17.   With respect to claim 6, the method is characterized in that the mutation comprises erasing the first block (Assar, page 16, lines 22 – 25).

18.   With respect to claim 11, the system is characterized in that the system is arranged for initially constructing a table in which the value of the counters of the blocks are stated (Assar, figure 9).

19.   Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Assar, or Asser in

view of Bruce as applied to claim 1 above, and further in view of Masters (US Patent No.

6,092,160).

         Asser and Bruce disclose all of the limitations of the parent claim as discussed above.

However, they do not specifically disclose that said copying is preceded by the step of copying

to another block any stored data of said first block that is not marked for erasure. On the other

hand, Bruce discloses swapping blocks for wear leveling (col. 7, lines 51 – 54). Masters

discloses a method of wear-leveling flash memory where copying of less frequently used second

block to the more frequently used first block involves swapping the data between the first block

and the second block (Masters, figure 5, 512).

         Applicants claimed step is a specific sequence in the swapping operation where the

content of the first block is temporarily stored in a third location before the content of the second

block is copied to the first block, so that the original data in the first block is preserved and

copied over to the second block to complete the swapping operation. The use of a third storage

location is inherent in a data swapping operation, as a temporary storage location is required to

be able to swap data without losing any information. As to the specific sequence of steps in a

swapping operation, one skilled in the art would recognize that there are two ways to perform the

swapping operation, just as there are two ways to add two numbers to obtains a sum of two

numbers. The first sequence is to copy the first block to a temporary store, copy the second

block to the first block, and then copy the original content of the first block from the temporary

store to the second block. The second way is to copy the second block to the temporary store, copy the first block to the second block and finally copy the data from the second block from the temporary store to the first block. One skilled in the art would have further recognized that either sequence can be used equally effectively to swap the data, just as adding a first number to a second number is as effective as adding the second number to the first number in obtaining a sum of two numbers.

It also would have been obvious to one of ordinary skill in the art, having the teachings of Assar and Bruce before him at the time the invention was made, to use the data swapping for wear leveling teaching of the flash memory storage system of Masters, in the flash memory storage system of Assar, so that the little worn block becomes heavily used and wear on the heavily worn block is substantially reduced (Masters col. 9, lines 52 - 53).

Conclusion

20.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Woo H. Choi whose telephone number is (571) 272-4179. The examiner can normally be reached on M-F, 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

whc

May 10, 2005

MATTHEW KIM

'''ISORY PATENT EXAMINF'

'' OGY CENTER 21''